

Application of **CACHE** to the **OHP** site

Renate Forkel (renate.forkel@kit.edu)

IMK-IFU
Karlsruher Institut für Technologie
Inst. f. Meteorologie u. Klimaforschung
Kreuzeckbahnstr. 19
Garmisch-Partenkirchen
Germany



CACHE Input

■ Canopy information

- Canopy height, trunk space height
- LAI
- BVOC emission factors
- (Height dependence of incremental LAI)

■ Meteorological, geographical, and soil information

- Course of solar radiation at canopy top
- Wind profile (*only available near surface*)
- Initial profiles atmospheric and soil temperature and moisture (*only available near surface*)

■ Chemistry information

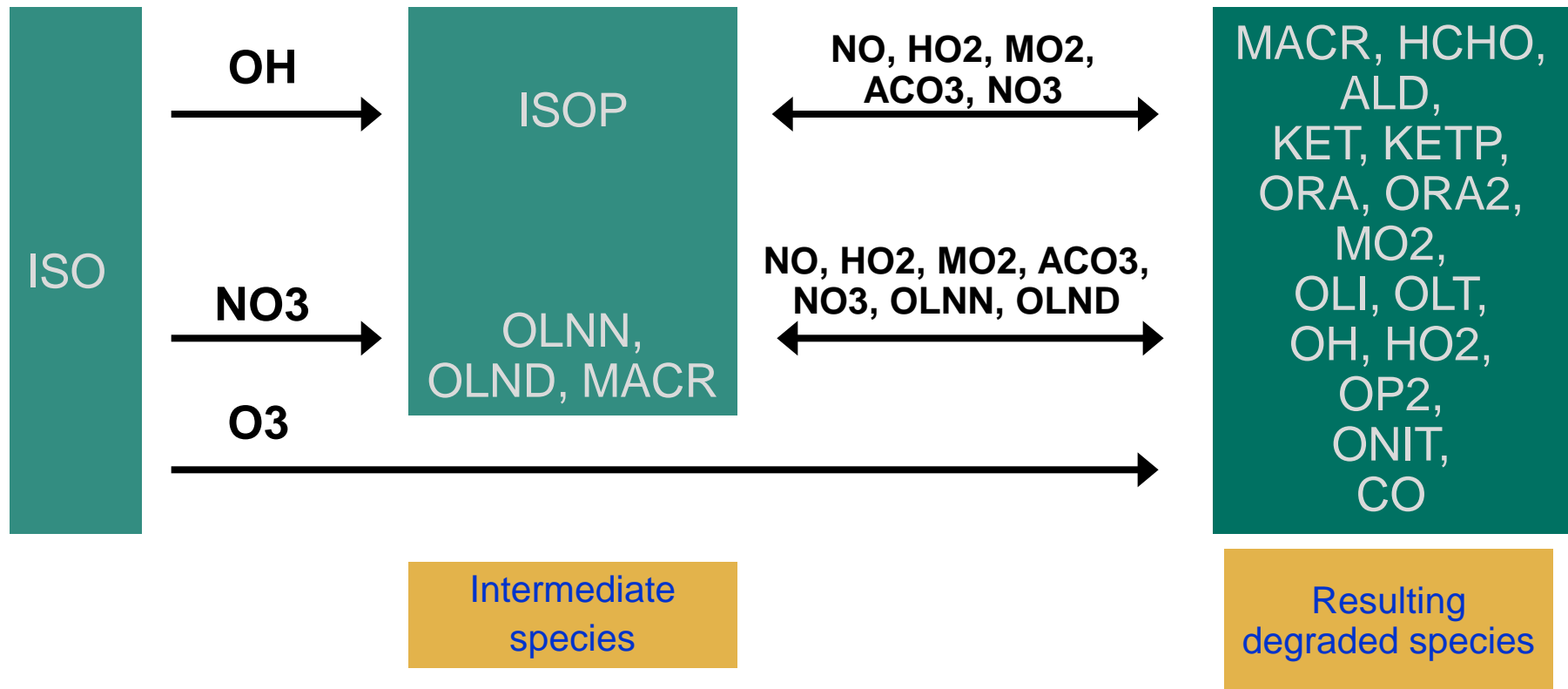
- Initial concentration profiles (*only available near surface*)

■ Information about advection

- Estimate source terms for heat, moisture, NO_x , (n.a., ***Very uncertain***)

RACM Isoprene Degradation

(Stockwell et al., 1997; jgr)

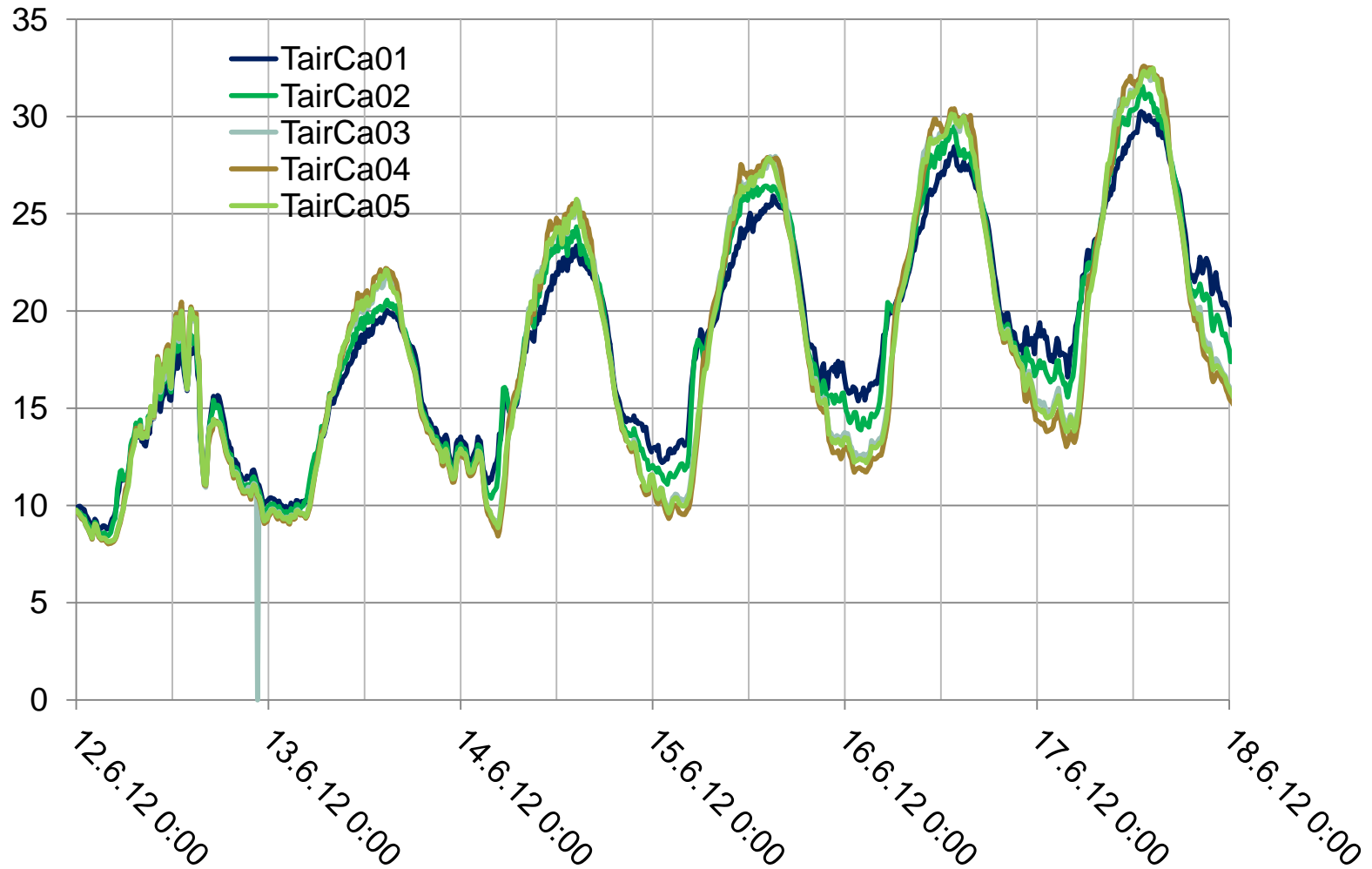


First setup for OHP site

- Episode 12. – 17. June 2012, LAI=2
- First guess isoprene emissions:
2500 ng/m² projected area/s from Schaab et al. (2000)
- Above-canopy radiation from measurement
- Near surface meteorology from OHP site
- Initial profiles of meteorological variables: guess
- Near BVOC and products from OHP campaign
- Initial profiles of BVOC and products: guess
- Ozone: guess from observed values at Manosque
- NO_x: guess for advection or soil NO emission

Temperature

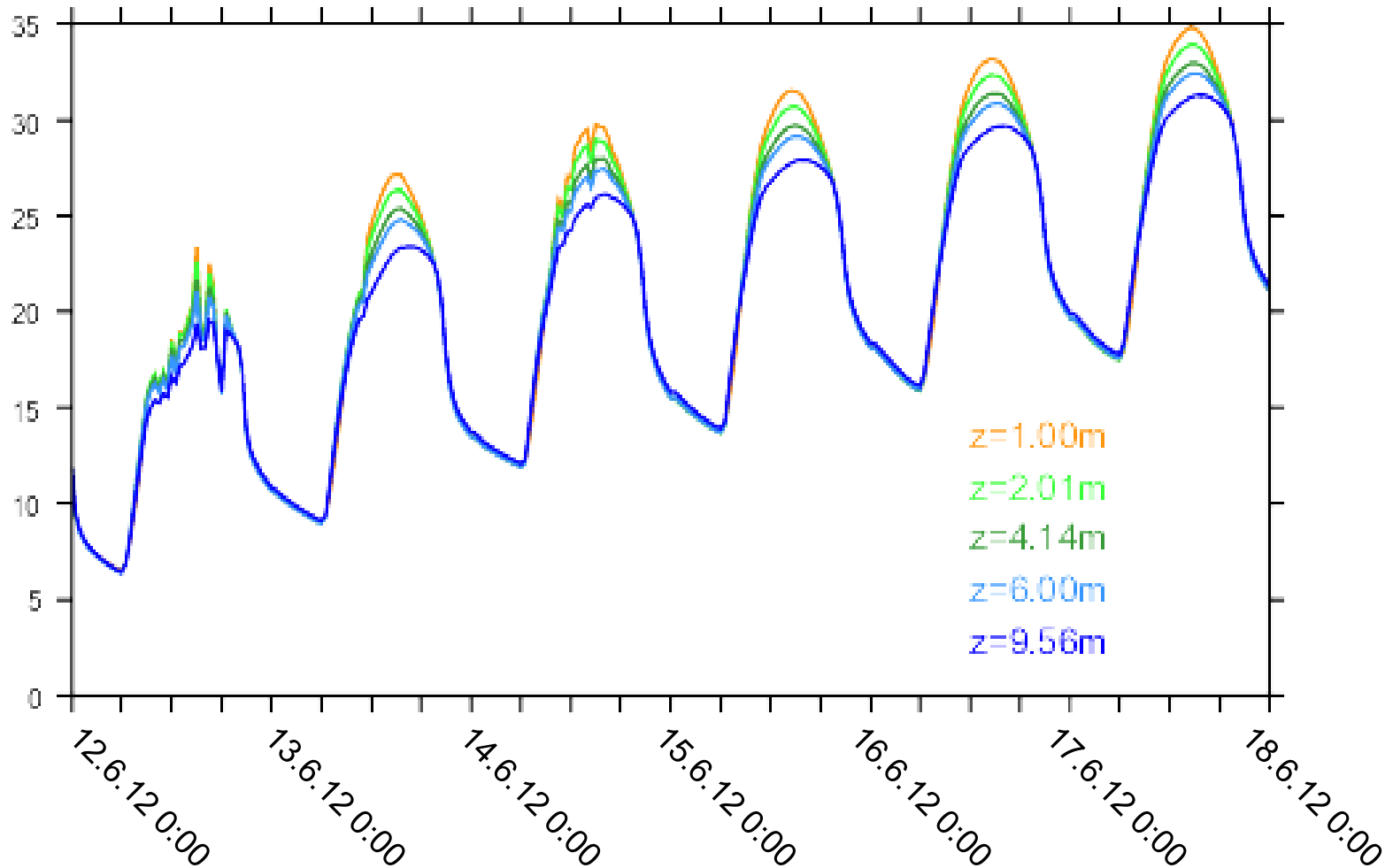
Observed



Temperature

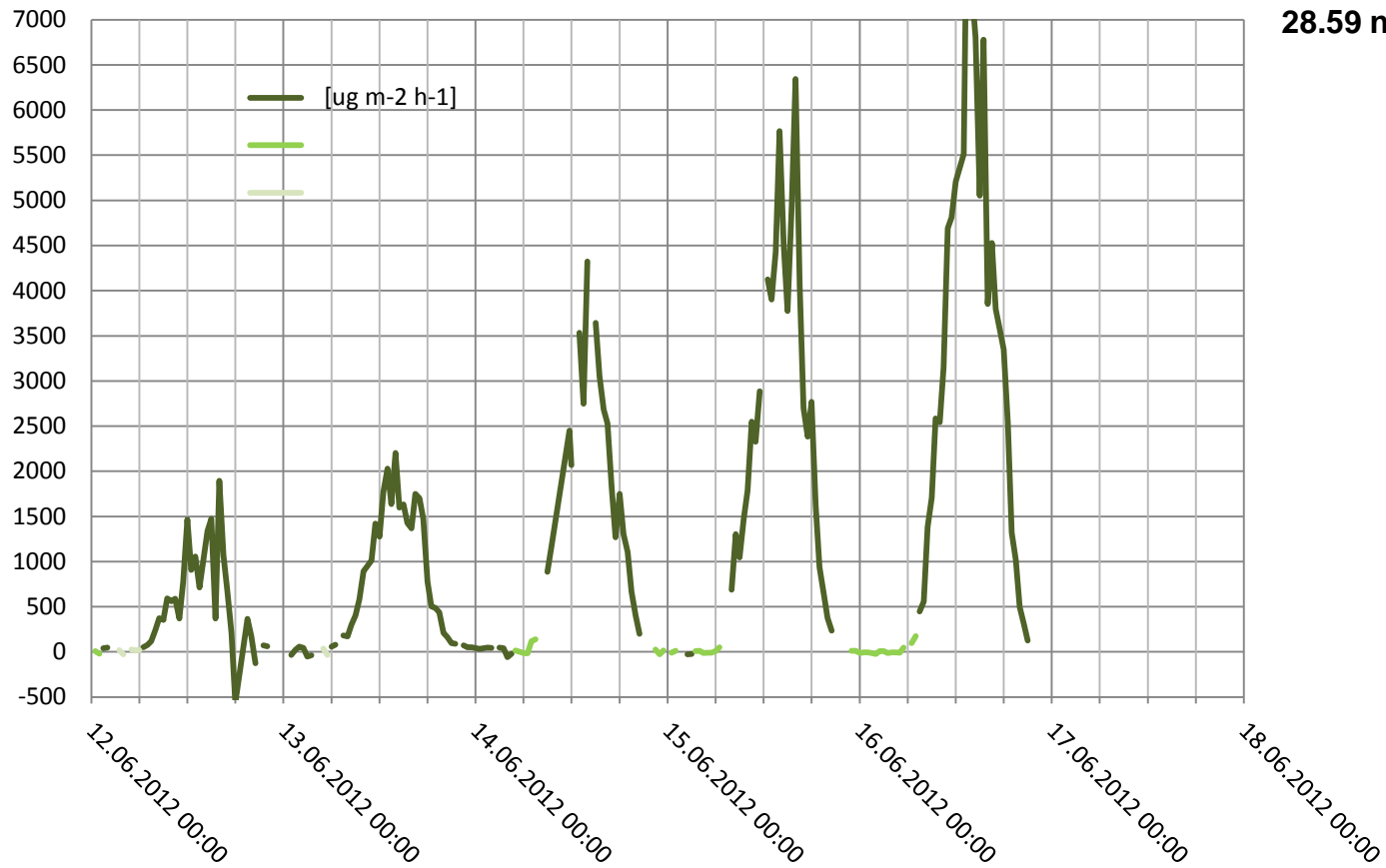
CACHE simulation

OHP



Isoprene Flux

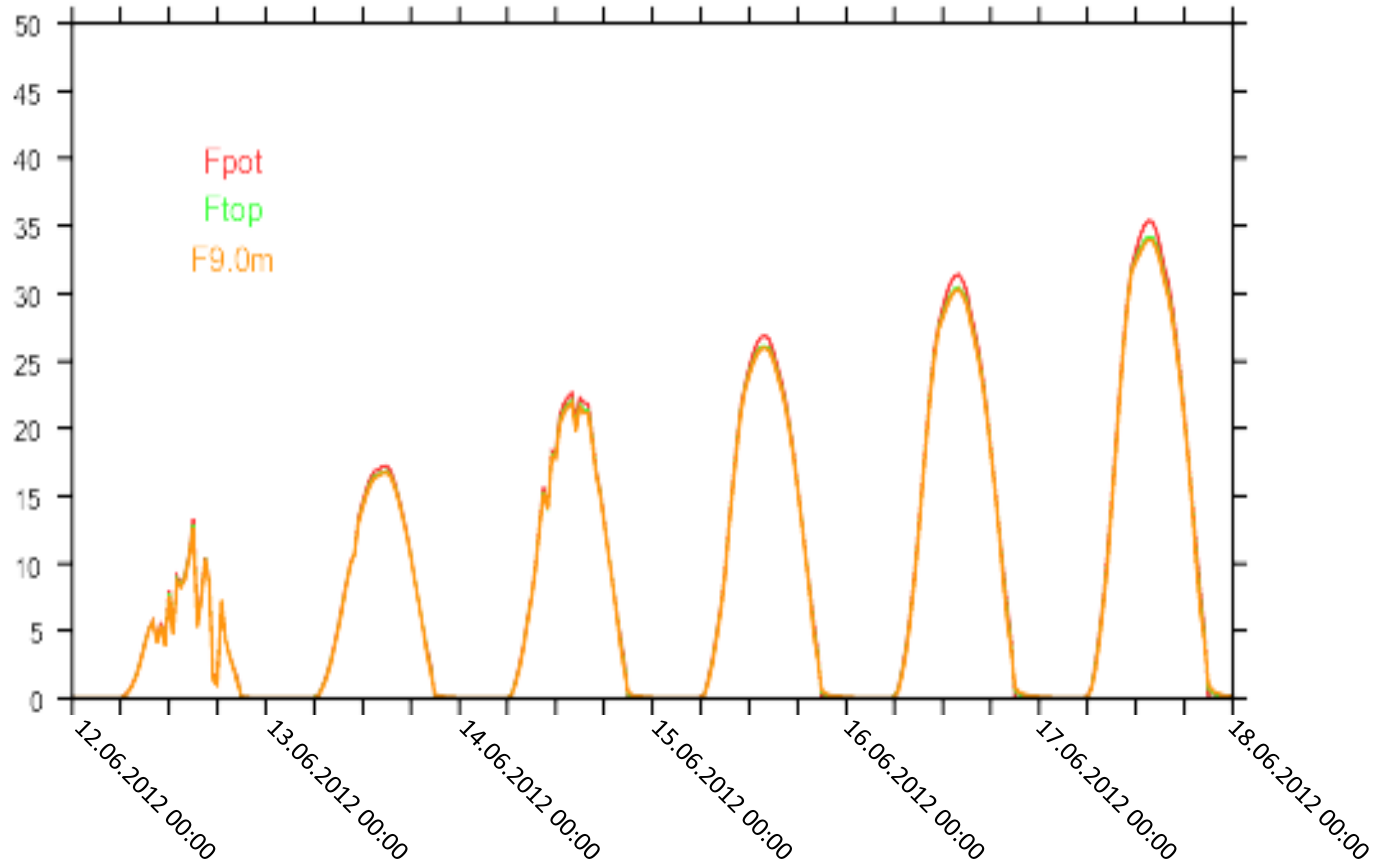
Isoprene



28.59 $\text{nmol/m}^2/\text{s}$

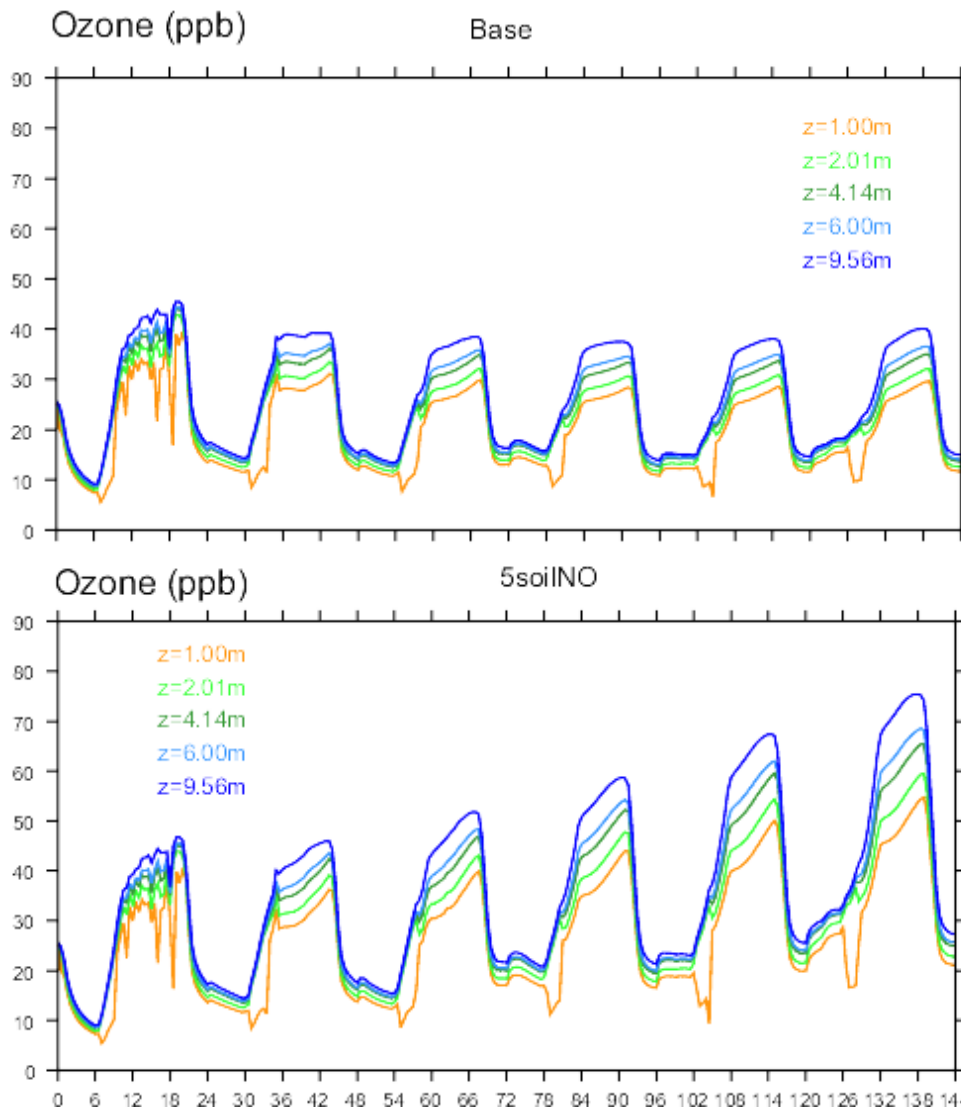
Isoprene Flux

Isoprene Flux ($\text{nmol}/\text{m}^2/\text{s}$) $1 \text{ nmol}/\text{m}^2/\text{s} = 244.8 \mu\text{g}/\text{m}^2/\text{h}$



Approximate agreement for $1000 \text{ ng}/\text{m}^2$ projected area/s

Ozone

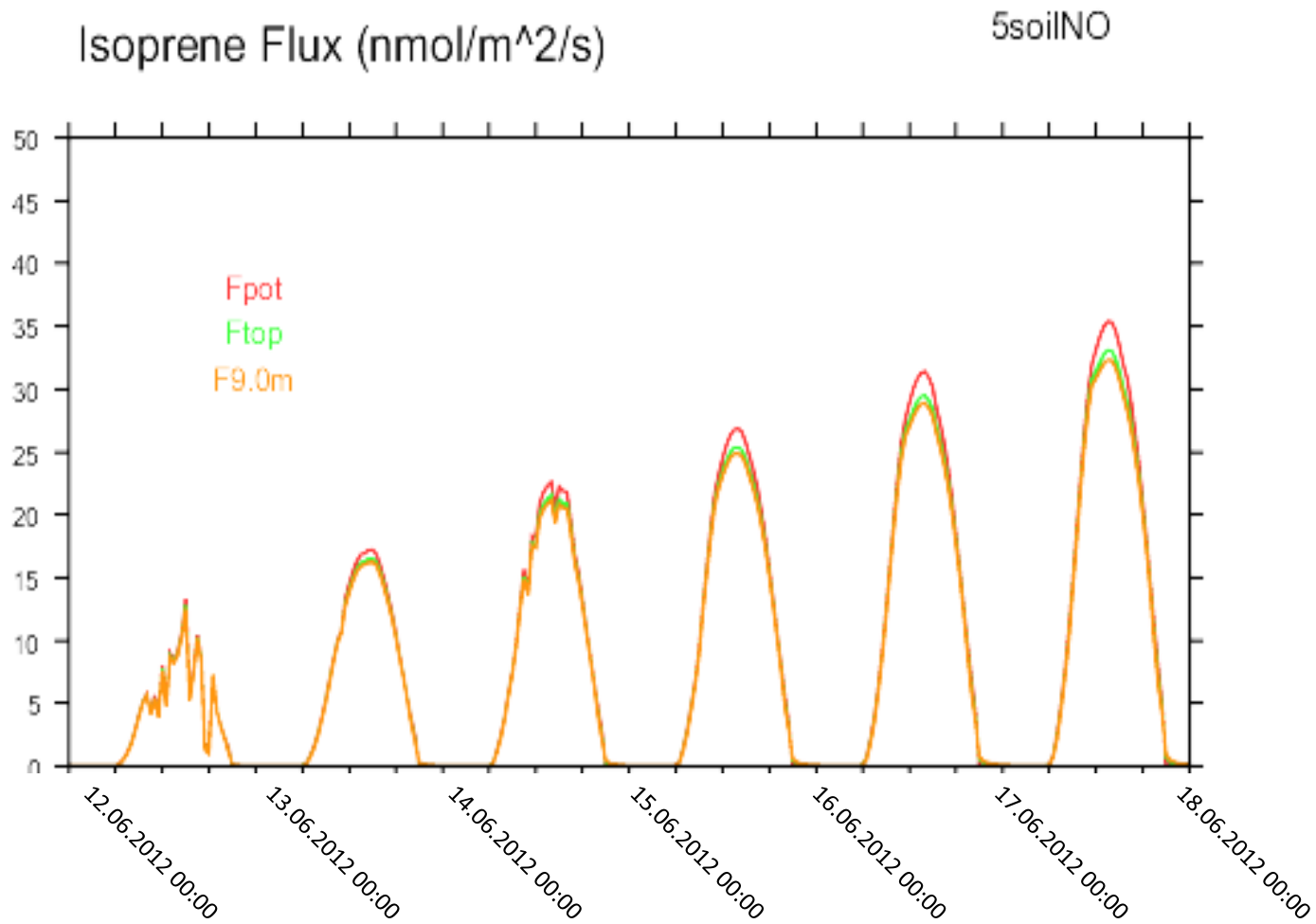


Observations at Manosque indicates higher ozone concentrations.

These values can only be obtained if NO_x is available, either from soil emissions or advection.

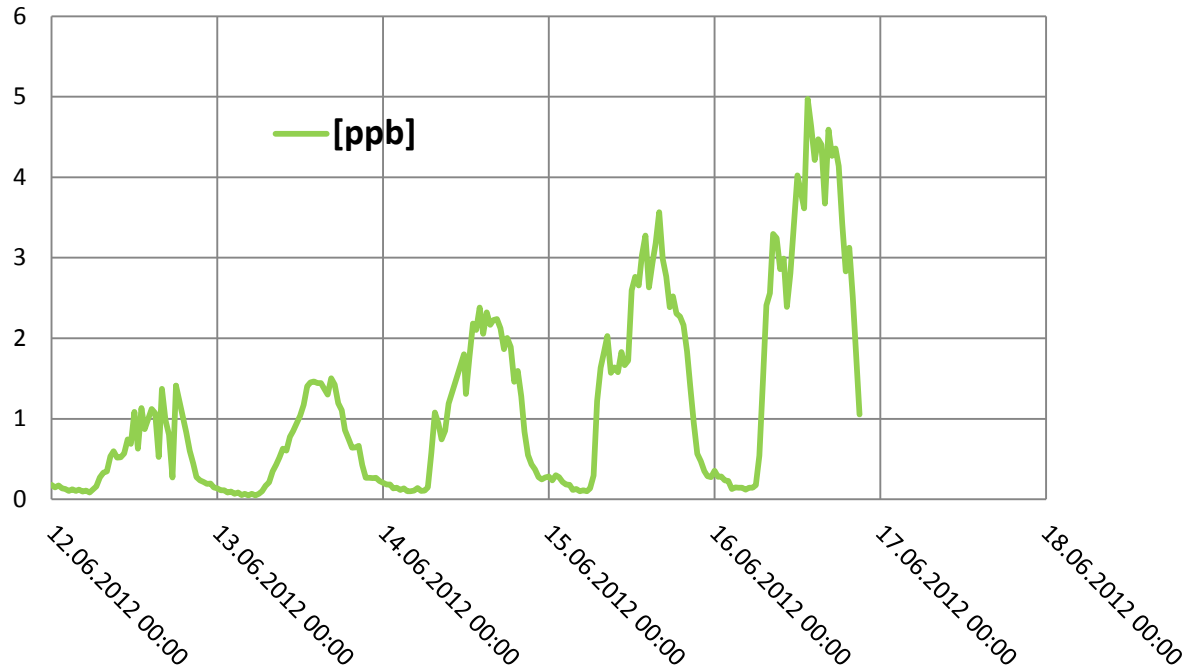
Example:
high soil NO emission

Isoprene Flux for higher ozone

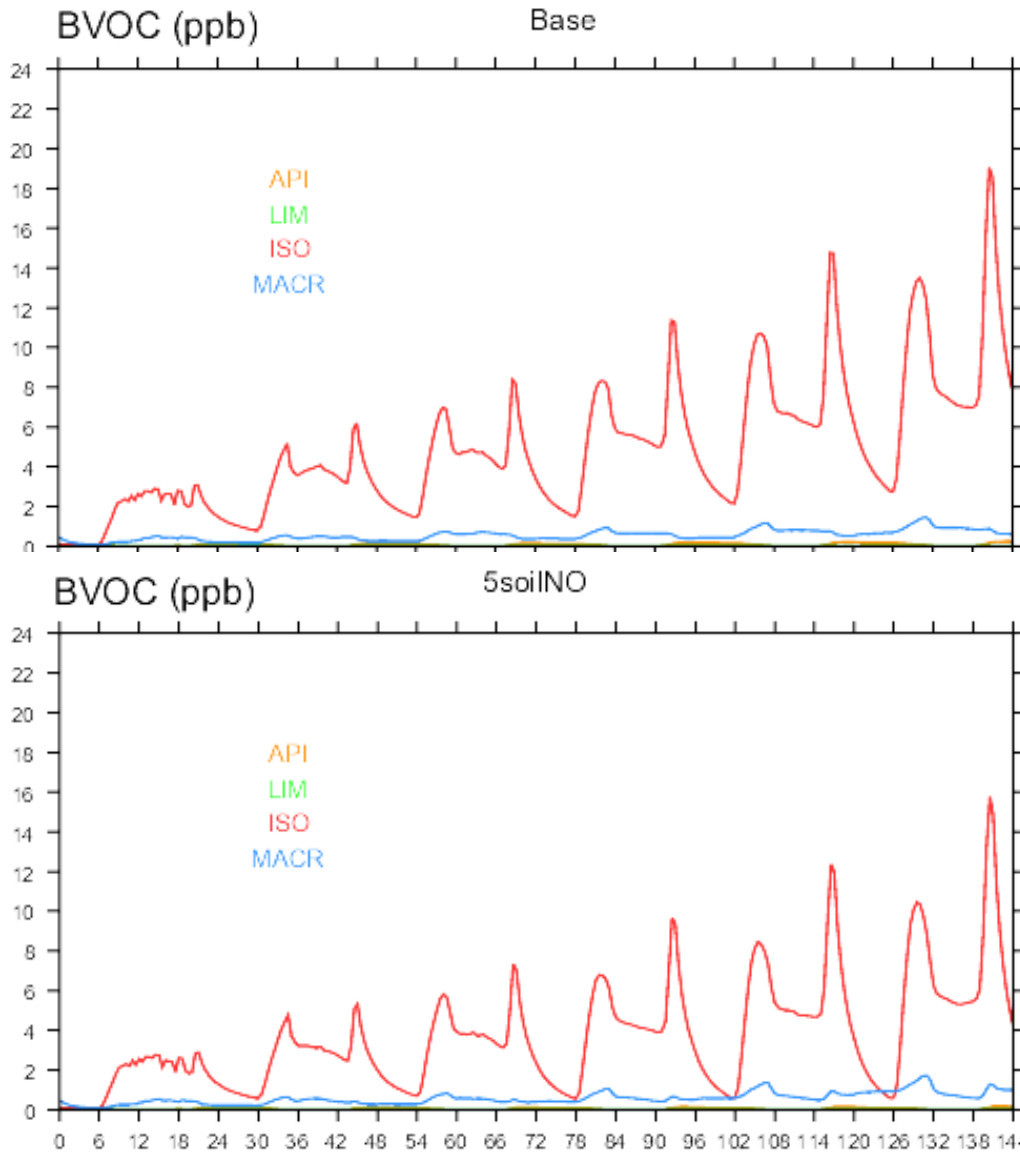


BVOC concentrations

Isoprene



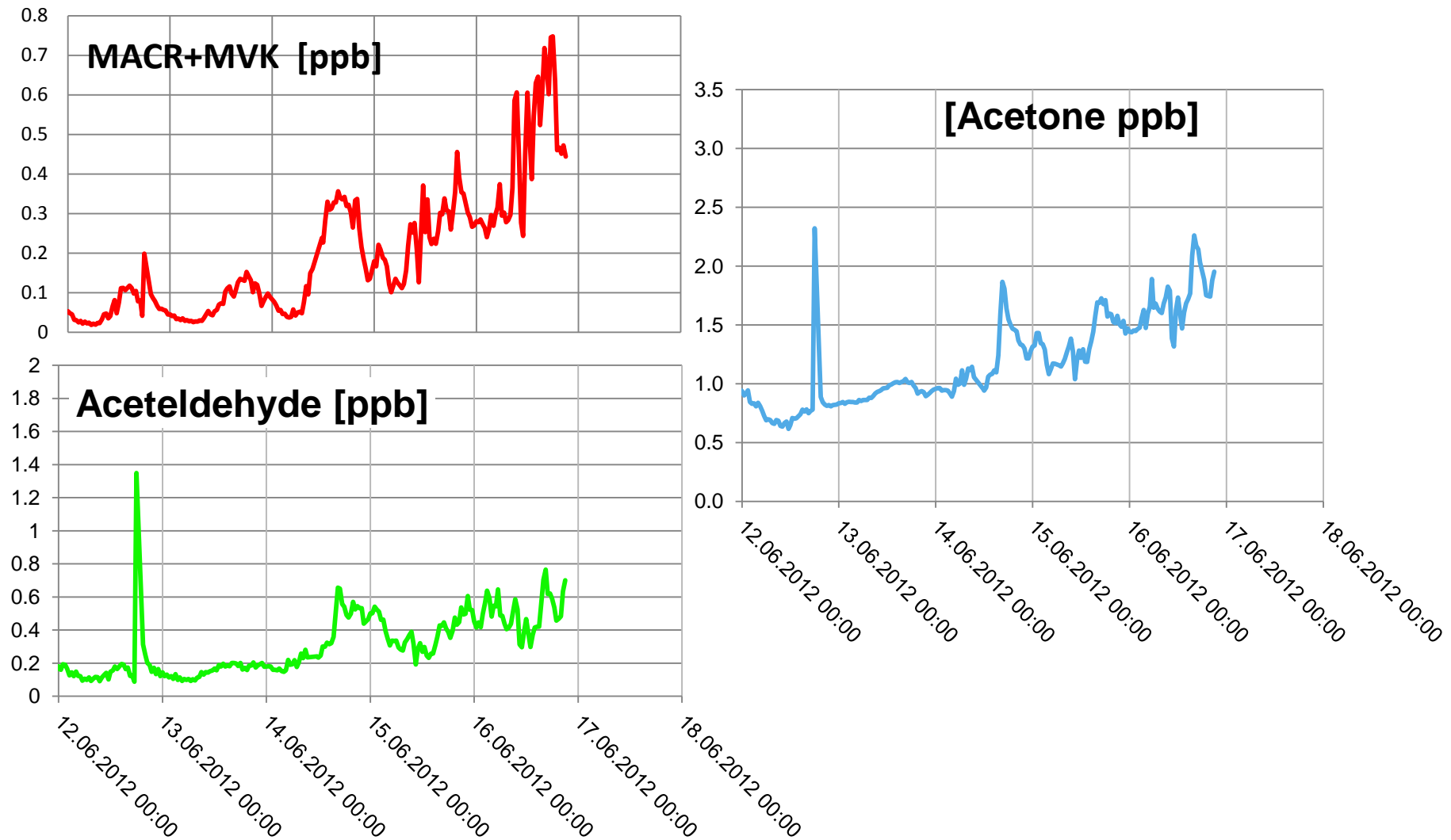
BVOC concentrations



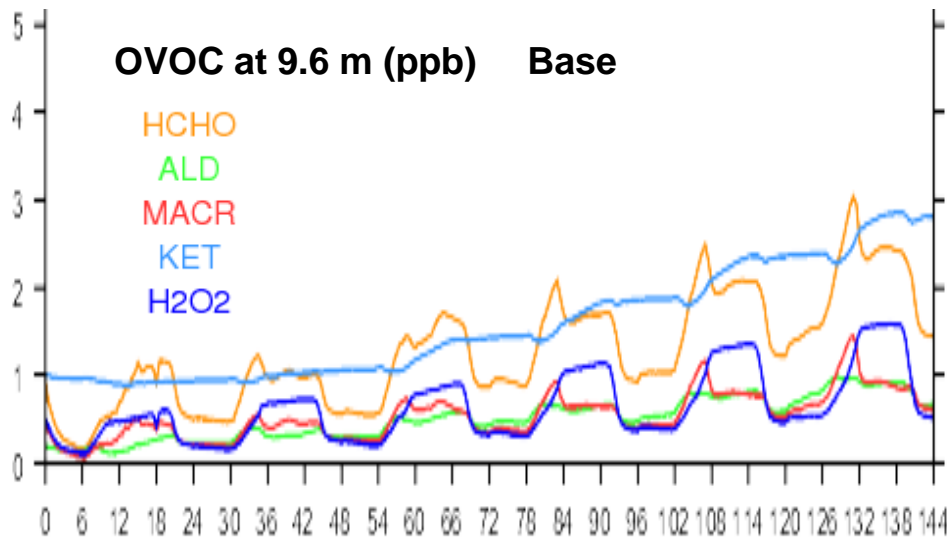
Pronounced peaks in the morning and evening

- Either too fast onset of isoprene emission in the morning and too late decrease in the evening?
- Too low turbulence in the morning and evening? Turbulence around noon to high?
- Increase of ozone too early?

Oxidation products

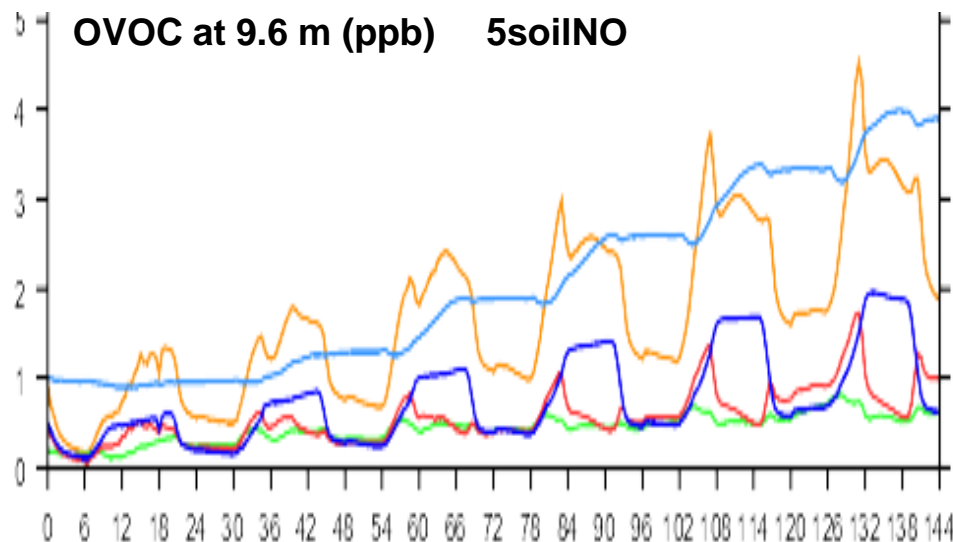


Effect of higher ozone on products



Enhanced deposition assumed for MACR, ALD, HCHO (not for KET)

MACR peaks perhaps resulting from isoprene peaks?
 Afternoon drop due to ozone



Conclusions and next steps

- Emission factors by Schaab et al. about 2.5 times too high
- Optimum Isoprene emission for a LAI of ca. 2
(lower T for LAI=3, too small leaf area for LAI=1)
- Still many open questions
- Information about NO_x and ozone profiles would be very helpful

- Investigate role of particular reaction pathways
- Tests for modified turbulence parametrisation
- Diurnal course of isoprene emissions

- Still many issues for discussion

Thank you for your attention



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Species and surrogate compounds in MIM

■ ACO3 Acylperoxy radicals (C>2)	RACM
■ ISO Isoprene	RACM
■ ISOP Peroxy radicals from ISO+OH	RACM
■ MACR Methacrolein, methylvinylketone and other unsat. carbonyls	RACM
■ MGLY Methylglyoxal and other α -carbonyl aldehydes	RACM
■ MO2 Methylperoxy radical	RACM
■ OLI Internal alkenes	RACM
■ OLT Terminal alkenes	RACM
■ ORA1 Formic acid	RACM
■ ORA2 Higher organic acids (C>2)	RACM
■ HACE Hydroxyacetone and other C3 ketones	MIM
■ ISHP β -hydroxy hydroperoxides from ISOP+HO ₂	MIM
■ ISON β -hydroxyalkylnitrates from ISOP+NO and alkylnitrates from ISO+NO ₃	MIM
■ MACP Peroxy radicals from MACR+OH	MIM
■ MAHP Hydroperoxides from MACP+HO ₂	MIM
■ MPAN Peroxymethacryloynitrate and other higher peroxyacylnitrates from isoprene oxidation	MIM
■ NALD Nitrooxyacetaldehyde	MIM